

# **Boiler Plant Controls Upgrade**

Project No. 640-15-153

Department of Veterans Affairs

Palo Alto Health Care System

Palo Alto, CA 94304

## **STATEMENT OF OBJECTIVES**

**PROJECT TITLE:** Upgrade PAD & MPD Boiler Plant Controls

**PROJECT NO:** 640-15-153

**DATE:** March 23, 2015

### **EXECUTIVE SUMMARY**

- A. PROJECT DESCRIPTION:** This scope of work provides requirements for upgrading the combustion controls and trend history for two VA campus heating plant facilities. This construction project will upgrade boiler plant controls in Bldg. 40 at the VA Palo Alto campus, and Bldg. 114 at the VA Menlo Park campus.

The contractor shall perform work described in the scope of work below, to provide a complete and usable system.

- B. PROJECT LOCATION:** Bldg. 40, 3801 Miranda Avenue, Palo Alto, California, 94304; Bldg. 114, 795 Willow Road, Menlo Park, California, 94025, Veterans Affairs Palo Alto Healthcare System
- C. PROJECT TIMELINE:** Upon award the contractor shall complete all on-site work for this project within 180 calendar days of notice to proceed.
- D. PROJECT CONSTRAINTS:** The construction requires coordination with the COR and boiler plant manager. Two of three boilers at each location must remain operational at all times, such that only work on one boiler may be completed at a time, including testing and acceptance. In general, all work on upgrading boiler plant controls will only be performed during scheduled maintenance periods.

The contractor must follow interim life safety and infection control measures during construction for phasing plans, code compliance, and egress plans, and must coordinate all utility shutdowns that may impact facility functions with the contracting officer's representative.

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Contractors shall refer to the solicitation documents for the minimal submission requirements and instructions pertaining to this project. The contractor shall provide services during construction as outlined in this statement of objectives, as well as associated design documents, drawings and specifications. These construction services shall be provided to the Veterans Affairs Palo Alto Healthcare System (VAPAHCS), located at 3801 Miranda Avenue, Palo Alto, CA 94304, all in accordance with this statement of objectives and applicable contract terms or conditions.

## **1. PROJECT BACKGROUND**

- 1.1. Combustion controls systems currently serving the VA Menlo Park and VA Palo Alto boiler plants are obsolete and therefore a reliability risk as a combustion control platform. The current systems are Hays Republic products, installed approximately 20 years ago under VAPA projects 640-86-125PA and 640-85-148MP.
- 1.2. The current VA boiler plant combustion controls at Palo Alto and Menlo Park are made up of loop controllers and chart recorders. There are independent control stations at each boiler front. The control room has a plant master/sky valve controller and chart recorders. Control stations to be upgrade are as follows:
  - 1.2.1 Boiler pressure master, each boiler and control room
  - 1.2.2 Drum level control, each boiler and control room
  - 1.2.3 Plant pressure master, each boiler and control room
  - 1.2.4 Sky valve control, each boiler and control room
  - 1.2.5 Oxygen O2 trim and air controller will not be replaced
  - 1.2.6 Burner management system is not part of this upgrade project
- 1.3 Boilers (not in scope): At the Palo Alto campus, there are qty (3) Nebraska 35kpph package boilers operating at 90psi saturated steam. The boilers were built in 1994, NB#3066. The boilers have been in continuous operation since installation in 1995. At Menlo Park there are qty (3) Nebraska 20kpph package boilers operating at 125psi saturated steam. The boilers were built in 1994, NB#3053. The boilers have been in continuous operation since installation in 1995.
- 1.4 Burners (not in scope): At Palo Alto there are qty (3) Coen package burners, combination gas and oil fired CPF 21.5 integral burner management systems based on a Fireye EP160, (The BMS will not be a part of the upgrade). At Menlo Park there are qty (3) Coen package burners, combination gas and oil fired SDAF 17 with integral burner management systems based on a Fireye EP160, (The BMS will not be a part of the upgrade).

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- 1.5 The current combustion control strategy is based on “Single Point Positioning”. Firing rate is controlled by a boiler master loop controller with an input from a steam header pressure. Fuel and air are positioned by an electric jackshaft actuator. The burner fires natural gas to meet 30ppm NO<sub>x</sub> corrected to 3% O<sub>2</sub> at PAD and 25ppm NO<sub>x</sub> corrected to 3% O<sub>2</sub> at MPD. The NO<sub>x</sub> reducing mechanism is flue gas recirculation, (FGR). FGR is mixed with the air stream in the burner wind box. Changes to the burner equipment are not anticipated at this time. Detailed recent data from the burner/boiler performance may be provided by the COR or boiler plant manager.
- 1.6 The other control parameter is boiler drum level. The current control strategy is 2-element level control. As the level in the steam drum rises and falls the drum level loop controller positions an electric actuated feed water control valve.
- 1.7 The jackshaft actuator and feed water control valve actuator will not be replaced. Signal converter modules will be required for the actuators at Menlo Park only.

## 2. PROJECT PURPOSE AND DESCRIPTION – UPGRADING CONTROLS

- 2.1. The contractor for this project shall provide all labor, materials, equipment, tools, and supervision to upgrade the boiler plant controls systems as described in paragraph §1 above.
- 2.2. All boiler panel chart recorders and loop controllers will be removed. The Auto/Manual control stations including data/trends will be controlled and monitored by the combination of a new Combustion Control PLC and HMI. Each boiler will be controlled by a dedicated Auto/Manual boiler master control station.

### Upgrading Controls

- 2.3. Each boiler will display and totalize the following:
  - 2.3.1 Boiler steam flow
  - 2.3.2 Gas flow

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- 2.4. Each boiler will display and trend the following, trend history of no less than three years:
    - 2.4.1 Boiler steam flow
    - 2.4.2 Steam header pressure
    - 2.4.3 Boiler steam drum continuous blowdown conductivity
    - 2.4.4 Flue gas temperature
    - 2.4.5 O<sub>2</sub>
    - 2.4.6 Drum level
    - 2.4.7 Feed water flow
    - 2.4.8 Gas flow
  - 2.5 All control room chart recorders and loop controllers will be removed. The Auto/Manual control stations including data/trends will be controlled and monitored by a new PC with high definition monitor. The PC will serve as redundancy to boiler control station HMIs only.
  - 2.6 The control room (PAD) will totalize the following:
    - 2.6.1 Hospital steam flow
    - 2.6.2 House steam flow
  - 2.7 The control room (MPD) will totalize the following:
    - 2.7.1 Hospital steam flow
      - 2.7.1.1 Core Building
      - 2.7.1.2 Dom Daru
      - 2.7.1.3 90 psi Steam
    - 2.7.2 House steam flow
  - 2.8 Control room (PAD) will display and trend the following, trend history of no less than three years.
    - 2.8.1 Air temperature
    - 2.8.2 Steam header pressure
    - 2.8.3 Feedwater temperature
    - 2.8.4 Hospital steam flow
    - 2.8.5 House steam flow
  - 2.9 Control room (MPD) will display and trend the following, trend history of no less than three years.
    - 2.9.1 Air temperature
    - 2.9.2 Steam header pressure
    - 2.9.3 Feedwater temperature
    - 2.9.4 Hospital steam flow
      - 2.9.4.1 Core Building
      - 2.9.4.2 Dom Daru
      - 2.9.4.3 90 psi Steam
    - 2.9.5 House steam flow
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- 2.10 In order to allow control of the sky valve (stem vent valve) in the event of a failure of the control room PC, the contractor shall provide a loop controller (e.g. Siemens 353 Loop Controller, or approved equivalent) with no expansion board in the main control room of each boiler plant to act as a Sky valve control station.

### **Upgrading hardware.**

- 2.11 Based upon the current performance of all the boilers at both locations, a complete engineering package is required to meet the goal of increased reliability and achieving the required NOx emissions. The engineering phase of the project will serve as an equipment scope specification. The following components are to be provided:
- 2.11.1 Smart pressure and or differential pressure transmitters, with 3 way manifold where applicable, Hart protocol communication required, with configurable display. Qty (1) per boiler
- Drum level transmitter
  - Steam flow transmitter
  - Boiler flue out let temperature
- 2.11.2 Smart pressure and or differential pressure transmitters, with 3 way manifold where applicable, Hart protocol communication required, with configurable display. Qty (1) per plant (PAD).
- Hospital steam header flow transmitter
  - Steam header pressure transmitter
  - House steam flow transmitter
- 2.11.3 Smart pressure and or differential pressure transmitters, with 3 way manifold where applicable, Hart protocol communication required, with configurable display. Qty (1) per plant (MPD).
- Core Building steam flow transmitter
  - Dom Daru steam flow transmitter
  - 90 psi steam flow
  - Steam header pressure transmitter
  - House steam flow transmitter
- 2.11.4 In line fuel flow meters with non-resettable mechanical dial totalizers and 4 to 20 digital output. Qty (1) per boiler.
- Gas flow
- 2.11.5 In line water flow meter with 4 to 20 digital output. Qty (1) per boiler.
- Feedwater flow
- 2.11.6 Programmable Logic Controllers, (PLC). Allen Bradley CompactLogix or equal.
- Qty (1) per boiler

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- 2.11.7 Human Machine Interface, (HMI), Allen Bradley Versa View, minimum 10” screen. HMI must have the ability to trend up to 8 parameters and data log up to three years of trend history.
- Qty (1) per boiler
- 2.11.8 Personal computer, (PC) with 17” high definition monitor.
- Qty (1) for the control room
  - The control room PC will service as a redundant backup to the boiler specific HMIs, wiring to be via Ethernet Ring Technology for integrity
  - The system design shall include control strategies such that a single PLC failure will not interrupt automatic pressure control of operating units
- 2.11.9 Above devices are to be located and mounted in the current panels.
- 2.11.10 UPS backup with 120vline conditioning backup for 5min.
- Qty (1) per boiler and Qty (1) for the control room
- 2.12 The contractor shall be knowledgeable of all national, state, and VA healthcare standards, design guides and policies. The contractor shall maintain valid and current contractor’s licensure, verifications, and certifications, as applicable for this project. Superintendent shall have the 30 hour OSHA Construction Safety course, and all workers shall have at least the 10 hour OSHA Construction Safety course

### **3 STATEMENT OF BID ITEMS**

- 3.1 Item 1: General Construction. Upgrade the existing controls systems and panels at both boiler plant sites as described in this scope of work.
- 3.2 Deductive Alternate. Not used for this project.

### **4 AS-BUILT DRAWINGS**

- 4.1 Specifications and Drawings. The contractor may, at their own expense, create additional drawings and specifications for the purpose performing the work described in the contract, using electronic files furnished by the government.
- 4.2 As-built Drawings. The contractor shall be responsible to provide marked-up as built drawings upon completion of the work for the contracting officer’s representative, as well as provide clarification for any work elements in question. The contractor shall have 15 calendar days to provide the VA with these as built drawings after completion of the work.

### **5 SPECIFICATIONS AND SUBMITTALS**

## SCOPE OF WORK – VAPA / VAMP BOILER PLANT CONTROLS UPGRADES

- 5.1 The contractor shall furnish submittals for components and materials or common work elements to be utilized for approval by the Contracting Officer's Representative, prior to performing the work.
- 5.2 All submittals shall include 4 hard copies and 1 digital copy in \*pdf\* format. Samples shall include 2 sets each packaged individually and suitable for re-transmitting. All submittals shall be fully applicable to the work. All data, information and items not specifically applicable to the work shall be crossed out or otherwise edited to be clear and concise
- 5.3 All submittal drawings will be stamped by a Professional Engineer licensed in the state of California.
- 5.4 All submittals shall be approved prior to the purchase of the respective materials or the performance of any work. The submittals will be reviewed by The VA for conformance to this specification and the intent of these requirements. The VA review of the submittals shall not relieve the Engineering Contractor of any requirement or responsibilities for the performance of the work.
- 5.5 The submittals will be reviewed by the VA and returned to the Contractor in 20 working days after receipt by The VA. Any submittals reviewed with comments shall be re-submitted by the Engineering Contractor for further review by The VA, and until all comments have been resolved. No work shall be performed until all respective submittals have been reviewed without comment.
- 5.6 Initial Submittals: The following shall be submitted as a part of the deliverables:
  - Current Professional Engineers California license number
  - General Liability insurance certificate
  - Project experience installation list
  - Detailed schedule
  - Bill of materials with engineering details
  - Demo diagram
  - P&ID
  - Insert panel layout diagram.
  - Electrical schematic diagram
  - Loop diagram
  - I/O list.
  - PLC configuration/SAMA diagram
  - Electrical Panel Factory Test Procedure
  - Site Test Procedure
  - O and M manuals
  - Quality control procedures and methods to be applied to the work

### Materials

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### 5.7 Product Data: The following product data and information shall be submitted:

- Transmitter type, manufacturer and range
- Flow meter type, manufacturer and range
- PLC type and manufacturer
- HMI type and manufacturer
- PC type and manufacturer
- Transmitter calibration sheets

### 5.8 Transmitters:

- Low end Cutoff specification
- Allowable drift

## 6 COMPLIANCE WITH CODES AND STANDARDS

6.1 **VA standards.** In addition to applicable local, state, and federal laws or codes of practice, the contractor shall comply with all design drawings and specifications during the project, including applicable codes and standards described in the VA's design guides and design manuals, and the VA's standards for information technology. Applicable codes are available at the VA's Facilities Management Technical Information Library (TIL) at the web site: <http://www.cfm.va.gov/TIL/>. This includes specifications for general requirements and existing conditions, as well as common work results for plumbing, electrical, and other applicable sections within the TIL Master Specifications.

6.2 **Public health and safety.** To safeguard public health and safety, additional codes or standards may be imposed by the contracting officer's representative, VAPAHCS Safety Officer, and Infection Control Officer. These additional requirements will be given to the contractor by the contracting officer's representative and shall be included in the construction documents and specifications.

## 7 ADDITIONAL CONSIDERATIONS

7.1 **Construction Plans and Phasing:** The contractor shall adhere to applicable construction and phasing requirements developed by the Veterans Affairs. In particular, two of three boiler plants at each site must remain operational at all times. These requirements also include:

7.1.1 Construction and Demolition Waste Management.

7.1.2 Restoration Plan: Including, but not be limited to, general requirements, restoration for any damages to existing walls, ceiling, equipment, wires, or utilities during construction.

7.2 **Utility shutdowns.** The contractor shall be responsible to identify utility shutdowns that may impact facility functions. The contractor shall manage the orderly shut-

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down and connection to existing utilities as needed, including but not limited to electrical and controls systems, as well as coordinate such that construction does not interfere nor interrupt VAPAHCS operations outside of the construction area. The contractor shall coordinate all utility shutdowns with the contracting officer's representative. Contractor shall anticipate such shutoffs shall occur outside of normal business hours as much as possible (Weekends or After normal Working Hours) to mitigate the impact on the facility.

- 7.3 **Interim Life Safety Measures (ILSM).** Contractor shall coordinate with the contracting officer's representative, VA Safety Officer, and VA Infection Control to comply with any Interim Life Safety Measures required during construction. This may include, but is not limited to, adhering to phasing plans, code compliance plans, egress plans, and project specifications. Life Safety Measures will include ensuring that the equipment staging or lay down areas, if applicable, comply with applicable VAPAHCS safety requirements. Any staging or lay down areas and construction fencing must be coordinated between the general contractor and contracting officer's representative.
- 7.4 **Security Considerations.** At no time will the vendor be in contact or have access to VA sensitive information. VA sensitive information procedures will be followed per VA Handbook 6500.6. The Contractor will adhere to VAAR 852.252-75, Security Requirements for Unclassified Information Technology Resources (Interim-October 2010).
- 7.5 **Station Operations.** The contractor shall generally perform all on-site visitation or work between the hours of 8:30 AM and 4:30 PM, Monday through Friday (Federal Holidays excluded), unless otherwise approved by the contracting officer's representative, although work may be required outside of normal business hours in order to accommodate constraints for maintenance or avoid adverse impact to daily boiler operations.

## 8 COORDINATION AND EXECUTION.

- 8.1 **Engineering package.**
- 8.1.1 A part of the engineering package is to provide a system Factory Acceptance Test (FAT) and a designated representative to provide related support for the VA.
- 8.1.2 Minimum experience required for control related work is 3 years. Attach installation list. Engineering firm to be located near to Palo Alto and Menlo Park, within a 150mi radius.
- 8.1.3 Drawing must be stamped by a Professional Engineer licensed in the State of California.

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- 8.1.4 Installation upgrades to be completed one boiler at a time per site. An individual boiler at each location can occur simultaneously.
  - 8.1.5 Redundancy provision in the case one boiler HMI fails the control room PC can take over for any of the boiler station HMIs. Connectivity not to be daisy chained but dedicated connectivity via Ethernet Ring Technology.
  - 8.1.6 Work Execution and Alternates: The intent of this part of the specification is to provide the general requirements for the performance of the work. The Engineering Contractor shall suggest, in its proposal and prior to the award of the Purchase Order, all cost effective and alternative approaches deemed to be in the best interest of the VA.
  - 8.1.7 Project Close-out: At the completion of the work, the Engineering Contractor shall provide The VA with all material warranties and maintenance instructions.
  - 8.2 **Commissioning.** A part of the engineering package is to provide field services to commission the controls. Demonstrate combustion controls functionality and that NOx emissions are the same or better than previously submitted data sheets. Demonstrate flow instrumentation accuracy. For example, boiler flows reconcile with hospital and house stream flows.
  - 8.3 **Warranty.**
    - 8.3.1 The contractor expressly warrants that all items covered by this project shall be in exact accordance with the requirements of this scope of work and all documents or samples referred to or specified; that all such items shall be free from defects in materials and workmanship; and shall be of the quality required herein. All services required by this project, or performed in connection with the fabrication or sale of the goods and equipment covered by this project, shall be performed in a good and working manner.
    - 8.3.2 This warranty shall survive any delivery, approval, inspection, acceptance, or payment and no such delivery, approval, inspection, acceptance, or payment shall be deemed to waive any of VA's rights hereunder.
    - 8.3.3 The warranty shall cover shall include all workmanship, labor, and materials.
    - 8.3.4 Contractor agrees to pay and discharge any and all costs, expenses or other charges incurred, to repair, replace, or modify any items to conform them to the requirements of this Purchase Order including the provisions of this warranty. Contractor specifically warrants its aforementioned items and services for twelve (12) months from date of acceptance of the work by the VA.
  - 8.4 **User Groups.** The contractor will be required to work with the below user groups responsible for managing this project. The contractor is advised that only the
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contracting officer has authority to alter the contract once awarded, or to legally obligate the government pursuant to any changes in the scope of the project thereof.

- 8.4.1 Contracting Officer (CO): The CO shall be responsible for all contractual administration of this project. All transactions of a legal nature, including contractual agreements, amendments, change orders, etc. shall be approved and processed through the CO.
  - 8.4.2 Contracting Officer's Representative (COR): The COR shall be responsible for the construction management on behalf of the VA and will manage the project on a day-to-day basis to ensure that the project requirements are met from the notice to proceed through completion of the work and acceptance, according to project scope of work and construction documents or specifications.
  - 8.4.3 Users: The contractor may be required to work closely with the user groups, generally through the coordination of the COR, in order to mitigate or minimize impact to ongoing operations in adjacent workspaces. Project user groups for this project may include the facility maintenance and support staff.
  - 8.5 **Construction Administration.**
    - 8.5.1 Project Schedule. After award of contract the contractor shall provide to the VA a detailed schedule of all project activities, including milestone dates and critical paths, as well as update such schedule if plans are modified during the course of the project.
    - 8.5.2 Schedule of Values. The contractor shall provide a schedule of values, along with the project schedule, which is aligned with the various activities of work. This schedule of values, if approved, may be used by the contracting officer's representative as a basis for evaluating reviewing progress performance and payments.
    - 8.5.3 Observation and Site Visits. The contracting officer's representative and/or designated representatives may require access in order to monitor, observe, and review all aspects of the project to ensure compliance with the construction documents and other regulatory requirements.
    - 8.5.4 Project Meetings and Inspections. The contractor shall be required to attend or provide a designated representative for coordinated field observation inspections for progress evaluations and reports, and other site visits as needed, including punch list or pre-final and final inspections. Such inspections may occur on a monthly basis, or more frequently as needed. The contracting officer's or other designated representatives may inspect all aspects of the project in order to complete written progress reports, including the performance of work activities in the project schedule or schedule of values, and verification of the contractor's compliance with applicable safety, infection control, or interim life safety requirements.
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- 8.5.5 Submittals. The contractor will be responsible to furnish submittals in accordance with the design specifications and submittals register. The contractor shall submit shop drawings, schedules, manufacturer's literature and data, and certificates in electronic format. Physical samples shall be shipped directly to the AE for inspection, and one sample furnished to the contracting officer's representative for approval. Further details are provided in the project specifications for shop drawings and submittals.
- 8.5.6 RFIs and Change Orders. During construction the contractor may submit requests for additional information concerning the design or other aspects of the project; however these must be submitted in writing. These must include, at a minimum, a description of or background information for the issue in question, as well as a complete impact assessment for any recommended changes. The contracting officer's or designated AE representative will review, evaluate, and respond as required. Any proposed changes to the scope or deviations from the design documents may be submitted to the contracting officer's representative for review and discussion, however any such changes to the contract or scope of the project must first be approved by the contracting officer in writing before implementation.

## 9 ABBREVIATIONS AND ACRONYMS

AE	Architectural & Engineering Firm
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
CA	Commissioning Agent
CD	Construction Documents
CM	Construction Manager
CO	Contracting Officer
COR	Contracting Officer's Representative
DD	Design Development
GC	General Contractor
NEBB	National Environmental Balancing Bureau
NFPA	National Fire Protection Association
NTP	Notice to Proceed
O&M	Operations and maintenance documents
OSHA	Occupational Safety and Health Administration
SD	Schematic Development
SOW	Scope of Work
TAB	Testing, adjusting, and balancing
VA	Veterans Affairs
VAPAHCS	Veterans Affairs Palo Alto Health Care System

End of Section